by *Dendrobates*, as observed by Wyman, Kappler, and H. S. Smith, is not the least remarkable[1]. This Batrachian was found to carry its tadpoles on its back, fixed by their buccal suckers, with the object, it is believed, of transporting them from pool to pool. Precisely the same mode of parental care is shown by a frog of the family Ranidæ, *Phyllobates trinitatis*, Garm., a native of Trinidad and Venezuela. A specimen from Venezuela, recently received at the Natural History Museum, is preserved in spirit with the tadpoles sticking to the back in the manner described in the case of *Dendrobates*.

The sex of the parent which transports the larvæ had not been ascertained in the case of *Dendrobates*. It is therefore of importance to state that in the present instance the feat is performed by the male (as figured on Plate X.), which is distinguished by an internal vocal sac. It was further desirable to ascertain whether any buccal peculiarities existed in the larvæ in connection with their habits, and as the specimens, six in number, are perfectly preserved, this examination offered no difficulty. But, as in the case investigated by Wyman, no peculiarities could be detected: the tadpoles are perfectly normal, of the Ranoid type. There are two series of labial teeth above and three beneath the black horny beak, the lower outer series rudimentary; the inner upper series is widely interrupted mesially, the inner lower very narrowly; the lip is bordered by a series of papillæ which is widely interrupted in the middle anteriorly. The spiraculum is sinistral and the anus dextral. The tail is about twice as long as the body.

EXPLANATION OF PLATE X.

Figs. 1, 1*a*. *Hyla goeldii*, Blgr., female carrying the eggs.
2. An egg from the above specimen, enlarged.
3. Young, on leaving the mother.
4. *Phyllobates trinitatis*, Garm., male carrying the larvæ.
5. Mouth of the larval *Phyllobates trinitatis*, enlarged.

March 19, 1895.

Sir W. H. Flower, K.C.B., LL.D., F.R.S., President, in the Chair.

The following papers were read:—

1. Preliminary Account of new Species of Earthworms belonging to the Hamburg Museum. By Frank E. Beddard, F.R.S.

[Received February 11, 1895.]

The collection of "Terricolæ" made by Dr. Michaelsen in South America is in some ways richer than that of the "Limicolæ"[2].

[1] *Cf.* Boulenger, Ann. & Mag. N. H. ser. 6, i. 1888, p. 454, & ii. 1888, p. 122.

[2] See Ann. & Mag. N. H. ser. 6, xiii. p. 205: "Preliminary Notice of South-American *Tubificidæ* collected by Dr. Michaelsen, including the Description of a Branchiate Form. By Frank E. Beddard, M.A., F.R.S."

The number of individuals is much greater; but the proportion of new species is not so great. The actual number of new species is, however, much greater. Considering that a good many papers have been written upon the terrestrial Oligochæta of this part of the world by Michaelsen, Rosa, and by myself, I was unprepared for the very large number of new species which Dr. Michaelsen has got together and kindly entrusted to me for description. The collection consisted exclusively of members of the four following families: Lumbricidæ, Perichætidæ, Acanthodrilidæ, and Cryptodrilidæ. The total absence of Eudrilidæ is not of course remarkable, except perhaps as regards the genus *Eudrilus* itself. The entire want of Geoscolicidæ is much more singular. Hitherto, however, the only Geoscolicid which has been found south of the Rio Grande do Sul is the *Titanus forguesi* of Perrier. North of this point the family is apparently one of the most abundant. The Perichætidæ are represented only by a single individual, but this family is not one which is common anywhere in the South-American continent. Their headquarters, as regards the New World, are certain of the West-Indian Islands. Lumbricidæ are fairly abundant in Dr. Michaelsen's collection; but then this cosmopolitan family is abundant everywhere. I am convinced that here as elsewhere the Lumbricidæ have been introduced. Dr. Michaelsen informs me in a letter that he observed the proportion of Lumbricidæ in his gatherings to diminish with the increased distance from the coast; in cultivated gardens near to the seaboard this family was the most abundant. This fact (which Prof. Spencer has confirmed for Australia) is an argument for regarding these worms as the result of intercourse between Europe and the countries in question. A fact which obviously points in the same direction is the invariable identity of the exotic species with European or North-American forms. The characteristic indigenous forms of the temperate regions of South America are of the families Acanthodrilidæ and Cryptodrilidæ. Both of these families occur in Central and North America as well; but they are not by any means relatively so abundant in the south temperate region of the continent. Moreover, the genus *Acanthodrilus* (s. s.) is only found in this part of the world, being represented in the tropical and north temperate parts by *Benhamia*, *Trigaster*, and *Diplocardia*. An examination of this collection, in fact, seems to confirm what previous researches upon the earthworm fauna of America appeared to indicate—namely, that it is possible to divide the Neotropical region into a tropical and a temperate section. The former is characterized by Geoscolicidæ, the latter by the genus *Acanthodrilus*. But in this last genus we have a correspondence between temperate South America and New Zealand. This correspondence is also emphasized by the great prevalence of *Microscolex* in South America and its fairly common occurrence in New Zealand. The Cryptodrilidæ collected by Dr. Michaelsen belong exclusively to this genus; and they are quite as abundant, though perhaps there are not so many species as the Acanthodrilidæ. *Microscolex*, however, is not so restricted to

the temperate part of South America as is the genus *Acanthodrilus*. I cannot see any way out of referring Eisen's recently constituted genus *Deltania* to *Microscolex*, a point which I enter into later. It seems, however, judging from the information at hand, that the headquarters of *Microscolex* are the more southerly parts of South America, and that it gradually dies out as we get north, finally disappearing in North America. The very small number of genera coupled with the large number of species is a remarkable feature of the earthworm fauna of the temperate part of South America. Up to the present we are only acquainted with four genera, viz. *Acanthodrilus*, *Kerria*, *Perichæta*, and *Microscolex* (leaving aside the Lumbricidæ as a foreign importation), from this part of the world. Among temperate countries, New Zealand forms a contrast; it possesses certainly six, if not more, distinct genera. I shall now proceed to treat of the different families seriatim.

Fam. Acanthodrilidæ.

This family, as already remarked, is represented in the collection by two genera only—*Acanthodrilus* and *Kerria*. The latter genus is represented by three species, of which I regard two as new. This genus, recently constituted by myself for a small aquatic species from the Pilcomayo and for Rosa's *Acanthodrilus spegazzinii*, has been increased by the addition of two new species from California. It therefore ranges through the South-American and part of the North-American continent. It appears to be rather a tropical form; Buenos Ayres and Valparaiso seem, so far as our present knowledge goes, to mark its southern limit. It is one of those genera that are both aquatic and terrestrial in habit.

Acanthodrilus is represented by a large number of species in South America. Altogether we are acquainted with the following, of which the names of those collected by Dr. Michaelsen are printed in italics:—

1. Acanthodrilus littoralis. *Kinb.*
2. Acanthodrilus hilgeri, *Mich.*
3. *Acanthodrilus pictus*, Mich.
4. *Acanthodrilus dalei*, F. E. B.
5. *Acanthodrilus platyurus*, Mich.
6. Acanthodrilus georgianus, *Mich.*
7. Acanthodrilus falclandicus, *F.E.B.*
8. Acanthodrilus aquarum-dulcium, *F. E. B.*
9. *Acanthodrilus bovei*, Rosa.
10. *Acanthodrilus decipiens*, n. sp.
11. *Acanthodrilus occidentalis*, n. sp.
12. *Acanthodrilus purpureus*, n. sp.
13. *Acanthodrilus magellanicus*, n. sp.
14. *Acanthodrilus bicinctus*, n. sp.
15. *Acanthodrilus minutus*, n. sp.
16. *Acanthodrilus chilensis*, n. sp.
17. *Acanthodrilus cingulatus*, n. sp.
18. *Acanthodrilus putablensis*, n. sp.
19. *Acanthodrilus carneus*, n. sp.
20. *Acanthodrilus corralensis*, n. sp.
21. *Acanthodrilus simulans*, n. sp.
22. *Acanthodrilus albus*, n. sp.

This part of the world must be undoubtedly regarded as the headquarters of this genus. New Zealand comes next in number of species; but there are only seven referable to the genus as strictly defined.

The South-American *Acanthodrili* do not form a definable section of the genus. They all agree, however, in having a clitellum

which is rather limited in extent; in only one species does it occupy more than segments xiii.–xvii.; in the New-Zealand species the clitellum often extends back to the xixth segment. The American species, too, are never of large size; a great many of them are very darkly pigmented, a circumstance which is only met with in *Acanthodrilus smithii* among New-Zealand *Acanthodrili*.

It is interesting that many of these species live equally well in fresh water and on land. *Acanthodrilus dalei*, for instance, and *Acanthodrilus pictus* occurred in Dr. Michaelsen's collection from freshwater gatherings as well as from those in forests. This peculiarity of the genus is not, however, confined to the South-American representatives. The New-Zealand *Acanthodrilus paludosus* and the Australian *Acanthodrilus schmardæ* also were collected from freshwater sources. I shall now commence the enumeration of the species collected by Dr. Michaelsen. In the description it will be understood that in all species the nephridia are paired, the dorsal vessel single, the spermathecæ in viii., ix., and, of course, the ovaries in xiii.

(1) **Acanthodrilus decipiens**, n. sp.

To a single specimen of *Acanthodrilus* from near Estancilla, Province of Valdivia, I give the name of "*decipiens*" on account of its strong superficial likeness to a *Microscolex*. I had at first passed it over as an example of that genus, which occurs in the same region. This species is one of the smallest of *Acanthodrilus*; the measurements were: length 35 mm., diameter 2–3 mm. The number of segments of the worm were 110.

The colour (in alcohol) is of a rich brown above, the setæ being implanted within white circles.

The prostomium is continued over the buccal segment by parallel furrows. The setæ are paired, but not so strictly as in *Acanthodrilus dalei*, for instance. The implantation of the setæ is such as to give to the posterior part of the body a quadrangular aspect.

The clitellum occupies segments xiii.–xvii.

Dorsal pores are present.

There appear to be small median genital papillæ upon segments xvii. and xix., with a larger also median papilla upon xx.

As there was only a single specimen of the worm, I am not able to give a complete account of the internal structure, which, however, shows no specially interesting peculiarities.

The gizzard is very large and stout, relatively to the size of the worm.

The spermathecæ have each a single good-sized diverticulum.

The spermiducal glands extend through two or three segments only; the penial setæ, of which I found seven mature and immature in a single bundle, are of a fair length, but are not ornamented.

Hab. St. 41, Estancilla, Valdivia.

A larger specimen from St. 47 measured 46 mm.

(2) **Acanthodrilus occidentalis**, n. sp.

In point of size this is the most conspicuous of all South-American species of *Acanthodrilus*; about a dozen specimens in all were collected by Dr. Michaelsen, and the largest of these slightly exceeds in bulk the largest example of *Acanthodrilus pictus*, which is its only rival in size.

The present species, however, differs from *Acanthodrilus pictus* in being entirely without integumental pigment, a fact which gives to it in the preserved condition a pale dirty brown colour. The worms are very soft to the touch and the segments are very much annulated. The general appearance, indeed, is like that of the New-Zealand species *Octochætus multiporus*; it is very different from that of any South-American species of the genus which I have had the opportunity of examining. The structure, however, does not in any way resemble that of *Octochætus*; *Acanthodrilus occidentalis* is a perfectly typical *Acanthodrilus*, though differing in detail from any other species known.

The largest individual at my disposal measured 192 mm.; its diameter was at the widest point 9 mm. The number of segments of this specimen was 365. The colour of the species after death has been already referred to; during life the colour was (according to Michaelsen) "blau grau; Kopfende zart rosa."

The clitellum during life was hardly visible; I could not detect its limits in the preserved specimens. The obscurity of the clitellum gave the worm a certain resemblance to many Geoscolicids.

The soft feel of the body is due to the minuteness of the strictly paired setæ; the setæ are implanted upon the ventral side of the body; the ventral area within the setæ is to the dorsal area as 7 : 11. On the anterior segments of the body I could not detect the setæ at all.

The prostomium is continued by grooves over the buccal segment.

The dorsal pores commence at the eleventh or twelfth segment.

The internal anatomy shows no characters of very great importance

Some of the anterior septa are thickened; this is the case with the six which immediately follow the gizzard.

The gizzard, in spite of its large size, is entirely contained between the septa which bound the sixth segment. There are no distinct calciferous glands; but the œsophagus is red and vascular posteriorly. The intestine begins in segment xvii.; it has a very rudimentary typhlosole.

The last pair of hearts is in segment xiii.

The reproductive organs are like those of other species of the genus.

There are two pairs of testes in x., xi.; these gonads are very much frayed out and extend right across their segments, looking as if they were attached to both walls.

The sperm-sacs are of fair size; they are racemose in form and are attached to the front walls of segments xi., xii.

The spermiducal glands are small and narrow; they are confined to their respective segments (the xviith and xixth), and lie transversely to the long axis of the body. The penial setæ with which they are provided are slender and unornamented.

The spermathecæ are like those of many species of *Perichæta* in the narrow tubular appendix, which is of the same length as the pouch. The diverticulum ends in a small dilatation.

Hab. St. 7, Valparaiso, Salto; St. 12, Valparaiso, Gärten.

(3) **Acanthodrilus magellanicus**, n. sp.

There were several specimens of this species, of which the one selected for measurement was 66 mm. long and 3·5 mm. in diameter; it consisted of nearly 100 segments.

The colour after preservation was a yellowish grey, owing to the absence of integumental pigment.

The setæ are not strictly paired; the ventral setæ are nearer together than the lateral setæ; but in the posterior part of the body there was less difference in the distance between the setæ.

The clitellum occupies segments xiii.–xvii.

On segment xi. are a pair of large genital papillæ. On the middle of segments xiv. and xv. is a narrow band of glandular appearance; finally, the pores of the spermiducal glands are situated upon large oval papillæ united nearly or completely in the middle line; they also bulge over the intervening segment so as to nearly obliterate it.

Corresponding to the position of the ventral setæ on segments xvii. and xix. are the apertures of the spermiducal glands. When this part of the body is mounted entire in glycerine and examined, the summit of each of the four papillæ already referred to is seen to be perforated by three orifices. One is the actual pore of the gland; the two others each correspond to one of the two penial setæ which accompany the glands; it is not common for the setæ to open thus independently of the glands. The orifices are precisely similar in appearance and are of equal size.

This species has a well-marked gizzard in segment vi. The septa separating segments vi./xii. are stout; the first septum lies between segments v./vi. The last heart is in segment xii.

The funnels of the sperm-ducts lie in segments x., xi.; the racemose sperm-sacs are in xi., xii.

The two pairs of spermathecæ lie as usual in viii., ix.; the pouch itself is oval, and it communicates with the exterior by a long cylindrical duct, which is not very much narrower but is rather longer. Just before the external orifice of the latter are two cæca, which really open by a common pore; they lie one above the other, and not laterally and symmetrically as in *Acanthodrilus bovei*. The two cæca are enveloped in a common sheath, but they are divided by a constriction superficially, which marks a real muscular septum which separates the two diverticula. The lower one is globular in form; the upper, which is larger, is more elongate.

The spermiducal glands are tubular in form and of fair thickness; there is a narrow terminal duct. The glands were bent into an S-shape, and did not extend beyond their segment.

The penial setæ are not particularly long. They are regularly curved like a bow. There were four of them in each bundle that I examined—two fully mature and two immature. The end of the seta is abruptly truncated, looking very much as if it had been broken off short. There can, however, be no question of such an accident, as all the setæ presented the same appearance. The free end of the seta, perhaps one-third of its entire length, is ornamented by transverse ridges, which are apparent at the edges as notches.

Hab. St. 99, Magellan Straits, Elizabeth Isl., under cow-dung.

(4) **Acanthodrilus minutus**, n. sp.

Of this species, again, I have only discovered a single specimen in the collection. I have been obliged, therefore, to exercise some care in my dissection of it.

It is of a pale brown colour in alcohol, being apparently without any integumental pigment. On a superficial inspection it might easily be mistaken for a small example of *Acanthodrilus bovei*.

The worm measures 29 mm., its diameter is 3 mm.; the number of segments 70. It is therefore, with the exception of the Australian *Acanthodrilus macleayi* (27 mm.), the smallest *Acanthodrilus* known.

The prostomium is continued by furrows over the buccal segment.

The setæ are strictly paired. In smaller immature specimens, but with more segments, the setæ were seen to diverge from each other posteriorly as in *A. platyurus* &c.

The clitellum occupies segments xiii.–xvii.

The gizzard is large for so small an earthworm, being 2·5 mm. long by 2 mm. broad. The intestine begins in segment xvii.

None of the septa appear to be specially thickened; but those in the neighbourhood of the generative organs are, as is the rule, somewhat more obvious than the others.

The testes and sperm-ducts are, as is often the case with the *Acanthodrilus* of America, single—that is, there are only one pair of each.

The sperm-sacs, racemose and of large size, lie in segment xi.

The spermiducal glands are thick but not very long; they are confined to their own segment. It is noteworthy that the posterior pair are distinctly smaller than the anterior pair, and less coiled. I have observed the same commencing disappearance (?) of one of the two pairs of glands in *Acanthodrilus schmardæ*. The penial setæ are long and recurved at the end in a crozier-like fashion, which is so common in the genital setæ of these earthworms. The extremity is expanded and thin, but not ornamented—two in each bundle.

The spermathecæ have a single rather large tubular to oval diverticulum.

Hab. St. 30, Putabla, Valdivia.

(5) **Acanthodrilus bicinctus**, n. sp.

Of this species there were two examples from Pictou Island and two from Juan Island. The two latter were rather larger than the former and showed a slight difference in the penial setæ, which will be referred to in due course.

The length is 42 mm., diameter 3 mm.; number of segments 80. The larger worm from Juan was 55 mm. in length.

The colour of the species is a dark purple, passing into an orange-brown on the ventral surface. The colour was darker than in most *Acanthodrili*. The prostomium is broad, narrower posteriorly where it is continued over the buccal segment for about two-thirds of its length. Posteriorly the prostomium bears a dorsal groove which is continued to the end of the buccal segment, and is apt to produce the impression of the prostomium entirely dividing the buccal segment.

The clitellum occupies segments xiii.–xvi.: in one specimen it was divided by a median furrow into two halves, each consisting of two segments; this circumstance suggested the specific name.

There are median unpaired genital papillæ, extending between the ventral setæ on segments xx. and xxi. in one individual, and in another on to the two following segments also.

The gizzard is well developed.

The reproductive organs are not very different from those of some allied species; I fancy that the gonads are only one pair of testes, and of course one pair of ovaries, but am not quite certain. In any case there is but a single pair of large racemose sperm-sacs in segment xi., as is so general.

The spermiducal glands are large and flattened, being coiled several times in one plane; the two following glands of each side of the body form an almost continuous mass occupying segments xvi.–xx. The narrow muscular duct of the gland arises from about the middle of the coil. It is accompanied by a sac containing two penial setæ which are fully mature, and two immature ones. The former are of a particularly bright yellow colour. One is bent like a bow in a regular curve and ends in a sharp point; its distal third is beset with sharp downwardly directed spinelets. The other seta is of quite a different form. To begin with, it is at least quite half as long again as the first and is more flexible; this appears to be shown by the whip-like curvature of the distal extremity, which is disposed almost in coils. It terminates in an obtusely pointed extremity. Less than the distal third of this seta is beset with excessively fine spinelets, much finer than in the other seta. There can be no question that both setæ are fully mature and they show a dimorphism. A similar dimorphism has been indicated by myself to exist in *Acanthodrilus georgianus*. It has also been met with elsewhere. In the specimen from Juan

Island which I examined the dimorphism was not apparent. The mature setæ were of the longer type with a flexible extremity; the end was slightly dilated and beset with very fine spinelets. If I had had more specimens at my disposal it is possible that it might have been found necessary to divide these examples from Juan Island into a distinct variety.

The spermathecæ (as usual in viii., ix.) are oval sacs with a moderately short duct; with the latter communicates the diverticulum, which is longer than the pouch and has a crenate outline above.

Hab. St. 174, Pictou Island; 58, Smyth Channel, Wide Bay, Juan Island.

(6) **Acanthodrilus purpureus**, n. sp.

Of this species there was only a single specimen in the collection. It was somewhat softened and therefore the measurements are perhaps a little higher than one would be inclined to allow as typical.

The length is 95 mm., the diameter 5 mm.; the number of segments 98.

The colour (in alcohol) is a reddish purple above, passing into an orange-brown below; the clitellum is distinctly without pigment, being yellowish brown.

The prostomium does not extend at all over the buccal segment.

The setæ are strictly paired.

The clitellum occupies segments xiii.–xvi. and is quite complete.

There seem to be no papillæ of any kind.

The gizzard lies in segment vii. The last heart is in xii.

The spermathecæ have each a longish tubular diverticulum dilated at end.

The spermiducal glands are loosely and irregularly coiled, extending through several segments; the penial setæ with which they are provided are curve-like and of moderate length only. The extremity is pointed and the distal end of the seta is furnished with numerous spinelets, which have a broad base of attachment and the points of which are directed forwards.

Hab. St. 81, Magellan Straits, Punta Arenas.

This species comes perhaps nearest to *Acanthodrilus bicinctus*. It indeed only differs by its much greater size, by the shorter penial setæ, and by the form of the prostomium.

(7) **Acanthodrilus chilensis**, n. sp.

This species, again, is unfortunately represented by a single specimen only, which had therefore to be discreetly dealt with.

It is 80 mm. long by 5 mm. in breadth; the number of segments 150.

The colour (in alcohol) is a dark purplish above, passing into an orange colour below.

The prostomium is completely joined to the second segment by furrows.

The setæ are strictly paired anteriorly; posteriorly they diverge slightly from each other, as is the case with *Acanthodrilus platyurus*; but the divergence is by no means so marked as in that species.

The clitellum occupies segments xiii.–xvi.

The dorsal pores are quite obvious, commencing at any rate on xii./xiii.

The gizzard occupies two segments, vi. and vii., the septum being present.

The septa dividing segments viii./xii. are thickened, but not much.

The last heart is in segment xii.

The sperm-sacs, as in so very many species, are in xi., and racemose.

The spermathecæ are longish and of a reddish colour; the diverticulum is considerably shorter than the pouch.

The spermiducal glands are not very long or much coiled; they are also reddish in colour. The penial setæ are brown, a colour which is, according to my experience, rare in *Acanthodrilus*. Their form hardly differs from that of *Acanthodrilus platyurus*.

Hab. St. 39, Teja Island, Valdivia.

This species is clearly a close ally of *Acanthodrilus platyurus*. The most ready way of distinguishing them is by the form of the spermathecæ. If it were not for the different position of the last heart I should have been inclined to regard the present species as merely a variety of *Acanthodrilus platyurus*. Three specimens from St. 48, Corral, appear to belong to the same species, but they are very much paler in colour. The spermathecæ have the same red colour and its diverticulum is similar. Possibly a larger series of specimens would allow of the separation of the two forms.

(8) **Acanthodrilus cingulatus**, n. sp.

Of this species five or six individuals were collected by Dr. Michaelsen.

The largest of them—the only one that was fully mature—measured 58 mm. in length by 4 mm. in diameter; the number of segments 106.

The worm is darkly pigmented, but the colour is more brown than purple.

The setæ are strictly paired and do not show any signs of divergence from each other at the tail end of the body.

The prostomium is continued by furrows over the buccal segment.

The clitellum is unusually far back for the American members of this genus; it extends from segment xiv.–xviii. inclusive.

Dorsal pores are obvious.

There is a large gizzard in segments vi., vii.

The spermathecæ are oval pouches with a smallish diverticulum not one-half of the length of the pouch.

The testes and the funnels are in segment x.

The spermiducal glands are coiled a good deal; the first pair are distinctly larger than the second pair; as this was found to be the case in two specimens not selected in any way, it may, I imagine, be safely regarded as normal for the genus. I have pointed out in the present paper that *Acanthodrilus minutus* shows the same peculiarity, also seen in the Australian *Acanthodrilus schmardæ*. The penial setæ are expanded and recurved at the extremity, and are very similar to those of *Acanthodrilus platyurus*.

Hab. St. 39, Island of Teja, Valdivia.

(9) **Acanthodrilus putablensis**, n. sp.

Of this species there were two examples, one of which was larger than the other. I had at first passed by the worms on the assumption that they were examples of *Acanthodrilus platyurus*. The coloration, however (of the preserved worms), is a little different from that of any of the examples of *A. platyurus* in the collection; and a nearer inspection showed other external differences which rendered their separation from *A. platyurus* even more obvious. The main external difference is in the arrangement of the setæ; but in order to appreciate it properly, for it is, after all, slight, it is requisite to compare individuals of both species somewhat closely; it can then be made out that, while there is the same divergence of the setæ of each pair from each other posteriorly, the distance which ultimately separates the setæ of each pair is distinctly greater in the species now under consideration than in the allied *A. platyurus*.

The worms were of stout build, and evidently rather contracted by the preservative reagent. The length is 82 mm. by 8 mm.; number of segments 150.

The skin of one individual was invaded by numerous encysted Gregarines. These formed a series of white warts upon the skin, a situation where I have never before observed Gregarines; the interior of the body was also full of the parasites.

The prostomium is quite completely developed, dividing the buccal segment.

The clitellum occupies segments xiv.–xvi.

The gizzard is stout and lies in segment vi.; after the gizzard are two thin septa; those separating segments viii./xiv. are strengthened. The last hearts are in segment xiii. It is the reproductive organs which show the greatest differences from *A. platyurus*. The testes, however, are, as in that species, one pair in x.; the funnels in the same segment are highly vascular, as are also the oviducts, which occupy the usual position. The sperm-sacs are not like those of *A. platyurus*, in that one pair exist in the xiiith segment; there is another pair in ix. Although the sperm-sacs are in xiii., I presume that the ovaries are there also, for the oviducal funnel undoubtedly projects into that segment.

The spermiducal glands are much like those of *A. platyurus*. They are somewhat slender and confined to their segments; the posterior pair was decidedly smaller than the anterior. The penial setæ are a facsimile of those of *A. platyurus*.

The spermathecæ have two symmetrically arranged short diverticula.

Hab. St. 30, Putabla, Valdivia.

(10) **Acanthodrilus carneus**, n. sp.

A number of specimens of this species were collected at Quilipue. They show when in alcohol a reddish-violet colour, which, however, is due to their tissues having taken up the colouring-matter from a Myriopod placed in the same bottle. The real colour of the worm during life is, according to Michaelsen, "schmutzig fleischfarbe; Gürtel weiss."

The length of one of the largest specimens was 52 mm. by 3·5 mm. in diameter. The number of segments of this specimen was about 100.

The prostomium is large and completely divides the buccal segment.

The setæ are paired, but not very strictly; the ventral setæ of each pair are rather closer together than are the lateral setæ.

The clitellum occupies segments xiii.–xvi. and is complete all round.

As is so often the case, this species is provided with a certain number of genital seta papillæ; as is also frequently the case with the worms of this genus, these papillæ are subject to some variation.

In one specimen there was a single eye-like papilla on the boundary line of segments x./xi. In another there were two median papillæ, one upon x. and the other upon xi.; in two others, and this appears to be the more typical arrangement, there were the two papillæ already mentioned and in addition to them paired papillæ upon ix.

The dorsal pores are quite conspicuous and begin in front of the clitellum.

The internal characters are not very different from those of other species.

The gizzard is well developed and lies apparently in segment vi.

The last heart is in the xiith segment.

There appears to be only one pair of testes and of funnels in segment x.

The sperm-sacs are in segments ix., xi.; those of the latter segment are very coarsely racemose. The penial setæ are unusually delicate and slender; they taper towards the free end, which is not ornamented; perhaps on account of their slenderness they are not of the yellow colour so usual.

The spermathecæ in viii., ix. are oval pouches with a wavy tubular diverticulum nearly as long.

Hab. St. 3, Quilipue.

(11) **Acanthodrilus corralensis**, n. sp.

Of this species there was only a single individual.

It is tolerably large, measuring 103 mm. in length by 5 mm. in diameter ; number of segments 145.

The colour is very much that of *Acanthodrilus pictus* ; and it also resembles that species in the fact that the prostomium only extends over about one half of the buccal segment.

On the other hand, *Acanthodrilus corralensis* differs from *A. pictus* in that the setæ are strictly paired from end to end of the body, being only to a very slight extent separated at the posterior end of the body. In this region the body has a roughly quadrangular section, the setæ being implanted at the angles. The symmetry of the figure, however, is broken, owing to the two ventral pairs being closer together than the two dorsal.

The clitellum occupies segments xiii.–xvii. and is complete.

The dorsal pores commence at any rate in the clitellar region.

None of the intersegmental septa are especially thick. Those separating segments x./xiii. are rather stouter than the others.

The gizzard lies anteriorly to the first pair of spermathecæ, but I am not able to fix its segment with precision. In the xivth and xvth segments, particularly in the latter, the œsophagus is enlarged and highly vascular, its lining membrane being folded.

The last pair of hearts are in segment xii.

The testes and sperm-duct funnels are one pair only in segment x. The racemose sperm-sacs are in ix. and xi.

The spermiducal glands are like those of a few other species of the genus in that the anterior pair are distinctly larger than the posterior.

The penial setæ, of which there were two in the bundle that I examined (the posterior on the left side), are crooked at the end like a crosier. The ends of the setæ have numerous denticulate ridges. The setæ resemble, in fact, very closely the penial setæ of *A. pictus*.

The spermathecæ are not very large ; each is an oval sac, to the duct of which is fixed the very slender duct of the appendix, widening out above into an oval sac. The diverticulum of the spermatheca is about half the size of the pouch.

Hab. St. 47, Corral, "Wald, unter Steinen."

(12) **Acanthodrilus simulans**, n. sp.

This species was found in a large gathering of worms from Corral in company with the last species and with a considerable number of examples of *Microscolex spatulifer*. The external characters of *A. simulans* are so like those of the last-named species that they were at first passed over accidentally. It is the colour which is so strikingly like. In the specimens of *M. spatulifer* from this locality the colour of the dorsal surface was a reddish brown instead of the more usual violet. Precisely the same colour was found in the *Acanthodrilus*. As this species is also

characterized by a complete prostomium and strictly paired setæ the likeness is increased. The length of the largest specimen is 82 mm., diameter 4 mm.; number of segments 150.

The clitellum was not developed. There are dorsal pores.

The gizzard is well developed and lies in vi., vii.; the œsophagus in segments xiv. and xv. is extremely vascular, being a bright red colour, which entirely disappears in the narrow section of œsophagus lying in xvi. The intestine begins in xvii. The last heart is in segment xii.

None of the septa are greatly thickened, nor are any of them extended backwards in the cup-like fashion so prevalent among earthworms. Septa ix./xii. are somewhat stouter. There appears to be only a single pair of testes and sperm-duct funnels in x. The sperm-sacs in ix. and xi are very large and coarsely racemose.

The spermiducal glands show the same inequality of size between the anterior and posterior pairs that has been noted in other species. They are both stout, but short and only slightly coiled. The penial setæ are not particularly long; they are spatulated at the free extremity, and, when seen in profile, doubly curved in the usual way. They are not, however, ornamented.

The spermathecæ occupy the usual segments. The single diverticulum is nearly as large as the pouch. It is chalky white (owing to the presence of spermatozoa) and has a crenate outline.

The posterior pair of spermathecæ are larger than the anterior pair, which is doubtless correlated with the difference in size of the spermiducal glands.

Hab. St. 47, Corral, "Wald, unter Steinen."

(13) **Acanthodrilus albus**, n. sp.

This species again is represented by a single specimen, which I at first passed over under the impression that it was *A. bovei*. It has the same long and slender form and absence of integumental pigment. *A. bovei*, however, has not been met with so far north on the eastern side of the continent as the present species, which may perhaps be looked upon as its representative there. Length 85 mm., diameter 2 mm.; number of segments 145.

The prostomium seems to be not continued across the buccal lobe, but I am not certain as to this point.

The setæ are paired; the ventral more strictly than the lateral.

The clitellum occupies segments xiii.–xvii.; there are dorsal pores.

The gizzard is well developed, contrary to what we find in *A. bovei*; it occupies the vith segment.

The intestine commences as usual in segment xvii. None of the septa are very much thickened; those of ix./xiii. are most so.

The segments occupied by the sperm-sacs are somewhat unusual. The sacs, which are racemose in character, occupy segments ix., xi., xii. As there were no sacs in segment x., I am inclined to believe that the testes and funnels lie there, but have not seen them. The spermiducal glands are slender and moderately coiled. The

penial setæ are long for the size of the worm and also slender. They are curved in the usual way and terminate in a very pointed extremity. The setæ are not ornamented. The spermathecæ are tubular in shape and have a tubular diverticulum of equal length.

Hab. St. 47, Corral, "Wald, unter Steinen."

Genus **Kerria**, Beddard.

The collection contained examples of at least three species of this genus, of which I regard two as new. The species which is not new is Rosa's *Acanthodrilus spegazzinii*. I have before expressed the opinion that this species is really a member of the genus *Kerria*. I am now in a position to confirm that supposition. The genus is at present chiefly known from an excellent paper by Eisen upon new species which he discovered in California.

The existence of this paper renders it necessary for me to enter into the minute anatomy of the species, to which I refer, or which I describe, for the first time in the present paper. The genus is, so far as we know at the present time, exclusively American. It also appears to be a tropical genus, or at least to be a native of the warmer parts of the American continent. The original species of the genus, Rosa's "*Acanthodrilus*" *spegazzinii*, was met with in the neighbourhood of Buenos Ayres; my species *Kerria halophila* was brought back by Mr. Graham Kerr from the upper reaches of the Pilcomayo River. The new species which I describe in the present paper were found at Buenos Ayres and in Valdivia. Eisen's species were found by him in Lower California. The two northern species of the genus differ from the southern species in having no gizzard and in having diverticula of the spermathecæ.

(1) **Kerria rosæ**, n. sp.

Eisen has used as a character for distinguishing the different species of this genus the number of setæ present upon the segments which bear the pores of the sperm-ducts and of the spermiducal glands. This character is probably valuable, but it must be used with circumspection. In two examples of the present species the setæ upon the segments in question differed. In one individual they were all present; in another the inner of the two ventral setæ was alone present on segments xvii.-xix., excepting on one side of one segment, where the outer seta alone was present. There is no doubt that this difference has some relation to the condition of the maturity of the worm, but the same remark may possibly apply to other cases.

The species to which these observations apply is a longish, thin worm, rather more than an inch in length and about 1 mm. in breadth. A large number of specimens were collected under stones on the banks of the river Baraccas do Sul near Buenos Ayres. The species is described by Michaelsen as having been "flesh-red" during life; none had a clitellum.

The alimentary canal has, as in *Kerria halophila*, a gizzard, but it is rather more slightly developed. The muscular walls are only about twice the thickness of the epithelial lining; the chitinous cuticle secreted by the latter is not at all thick. As in all the other species of *Kerria*, there are a pair of calciferous glands in the ninth segment. The structure of these is, however, a little more complicated than in *Kerria zonalis* or *Kerria macdonaldi*, in which species it has been figured by Eisen.

The walls of the pouch are of considerable thickness and project here and there as folds into its lumen. In the thickness of the walls run numerous blood-vessels; but the tissue of which it is composed is permeated by channels which are intra-cellular. The tissue in fact looks like a closely welded mass of nephridial tubules. The minute structure recalls that of the dorsal diverticulum of the alimentary canal in *Bucholtzia*, and it is—so to speak—an exaggeration of the structure which I have described in the distal part of the calciferous gland of *Gordiodrilus*. The œsophagus is narrow and nowhere sacculated; its ciliation commences at the orifice of the calciferous glands. The large intestine begins in segment xii. Septal glands are present as in other species. I did not find them further back than segment vii.

The anterior septa are thicker than those which follow. The stoutest are those between segments vi./ix.; but the three which come next are also moderately stout. The last heart is in segment xi.

The spermathecæ lie in segments viii. and ix.; they are sessile upon the body-wall, with no long stalk, nor have they any trace of a diverticulum. The extreme end of each pouch is enveloped in a thick muscular layer derived from the body-wall; this is continuous over the pouch for but a short way from the pore. The muscular sheath is so perfectly continuous with the two muscular layers of the body-wall that it is really impossible to say where the body-wall ends and where the sheath of the spermatheca begins. The lining epithelium of the spermatheca is folded and forms numerous narrow ridges.

The testes, sperm-sacs, ovaries, and oviducts are of the form, and occupy the positions characteristic, of the genus. The spermiducal glands are long and coiled; the muscular part of the organ is also of considerable length.

Hab. St. 204, Buenos Ayres, Baraccas do Sul, "Unter Steinen, Ufer des Flusses."

(2) **Kerria saltensis**, n. sp.

The general aspect of this apparently new species recalls that of the species *Kerria halophila*. But it evidently differs from that species, though not in very important points; indeed, all the American species of the genus come near together. I leave out in the following description the majority of the characters which are, so far as our present knowledge goes, of generic value and

confine myself to those characters which appear more or less to distinguish the species. It is a small species, about an inch in length; there is no pigmentation at all discernible. The clitellum occupies segments xiv.–xx., and is incomplete ventrally on the genital segmeuts, *i. e.* segments xvii.–xix. On those segments only the inner of the two ventral setæ are present.

There is a not very well developed gizzard in segment vii. The calciferous glands, as usual, are in ix. They are rather thick-walled, but are without any folds of the lining epithelium. The walls are vascular, but whether there is the mass of tubules which I have described in the last species I am unable to say. The intestine appears to begin in segment xiii. At any rate in this segment the lining epithelium undergoes a sudden change in thickness, being from that segment onwards much thinner; at the end of the twelfth segment the thick epithelium projects into the lumen of the gut of the next segment and forms a kind of trap which would allow of the passage of food backwards, but would not allow of its passage in the opposite direction. The first segment of the intestine, however, as I find it, is of less calibre than the section which commences in the fourteenth segment; but it differs from the section which begins in that segment by being rather folded.

The thick septa occupy segments v./ix., but the next two are thicker than those which follow. The last heart is in xi.

The spermathecæ, without any diverticula, are in viii., ix.; they consist of a thick-walled duct and of a thin-walled portion which is stored with sperm. The length of the two regions of the spermathecæ is about the same.

The epithelium which lines the thick-walled section of the organ which may be regarded as the duct is thrown into folds; there is no folding of the distal section. The testes are, as usual, in segment x. This segment also contains the sperm-duct's funnels. There seems to be only a single pair of sperm-sacs, which are in segment xi., and are not racemose in character. The cavity of the tenth segment contained a mass of developing sperm; but this cannot be regarded as the equivalent of a sperm-sac, for it was not surrounded by any membrane. The sperm-ducts were not developed in the specimen which I examined by means of transverse sections; on the other hand, the oviducts were fully developed, and their openings on to the exterior in segment xiv. were quite obvious. The spermiducal glands reached back as far as the twenty-fifth segment.

Hab. Valparaiso, Salto.

Fam. Cryptodrilidæ.

The family Cryptodrilidæ is represented in the present collection by the genus *Microscolex* only. Nor has any other genus belonging to this family been recorded from the southern parts of the American continent. Michaelsen's *Cryptodrilus spatulifer* is the only Cryptodrilid that we at present know from the temperate

regions of South America. Michaelsen does not pretend to definitely assign this species to the genus *Cryptodrilus*; he only placed it there (with a query) pending the revision of the Cryptodrilidæ. The classification of that family is one of the most difficult tasks for the systematist; the differences are so slight between species and species that the boundaries of genera are extremely hard to draw. I believe, however, that it is possible to define the genus *Microscolex* by the following characters:—

(1) Nephridia paired, beginning in the second to fourth segment.
(2) Male pores upon segment xvii.
(3) Sphermiducal glands tubular, provided generally with penial setæ.

This definition is naturally somewhat wider than that adopted by Rosa, the founder of the genus. But a number of new forms which I shall describe immediately necessitate an expansion of the genus. They do not present a sufficient number of salient differences to warrant the formation of a new genus. I have already proposed to include my genus *Rhododrilus* in *Microscolex*, and I do not see sufficient reasons for retaining the genus *Deltania* of Eisen. *Cryptodrilus spatulifer* of Michaelsen must, I think, especially in view of the new species to be described here, be relegated to *Microscolex*. The size is really the only bar to its inclusion. I find a good many individuals of *Microscolex dubius* which are really quite as large as many individuals of *Microscolex spatulifer*. The distribution of this genus is interesting. It is the commonest earthworm in point of number, and nearly so in point of species, in the temperate parts of South America. I quite agree with Rosa that it has probably been introduced into Italy and possibly also into Australia; I described a species from Teneriffe and one from Algeria which are very likely to be regarded in the same way.

The remaining species occur in New Zealand (*Microscolex minutus and M. novæ-zealandiæ*) and in California (the genus *Deltania* of Eisen).

Dr. Michaelsen's collection contained examples of the following species:—

1. *Microscolex spatulifer* (Mich.).
2. *Microscolex dubius* (Fletcher).
3. *Microscolex griseus*, n. sp.
4. *Microscolex michaelseni*, n. sp.
5. *Microscolex corralensis*, n. sp.
6. *Microscolex diversicolor*, n. sp.
7. *Microscolex longiseta*, n. sp.
8. *Microscolex robustus*, n. sp.
9. *Microscolex modestus*, Rosa.
10. *Microscolex gracilis*, n. sp.
11. *Microscolex papillosus*, n. sp.

It will be seen, therefore, that this collection contains a large number of new species; evidently South America is the headquarters of this genus as it is of *Acanthodrilus*.

Eisen allows three genera of worms where I only allow the genus *Microscolex*. These genera are of course my *Rhododrilus* and Eisen's *Deltania* in addition to *Microscolex*. *Deltania* is distinguished from both by the closer approximation of each pair of ventral setæ in the segments near to the xviith. *Rhododrilus* is distinguished from both by the separate opening of sperm-ducts and spermiducal glands. This latter character will hardly suffice as a mark of distinction; there are so many intermediate conditions in the genus *Microscolex* (s. s.). In *M. gracilis* the two unite well within the body-cavity; in *M. novæ-zealandiæ* just at the common orifice; in *M. papillosus* the external orifices are separate but still close together, in *M. michaelseni* at some little distance apart; finally in *M. modestus*, as I have an opportunity for stating here, the pore of the sperm-duct is positively in the next segment to that which contains the orifice of the spermiducal gland. Nor do I admit that the approximation of the ventral setæ in the genital segments is a character of sufficient importance to imply generic distinction. To begin with, *M. diversicolor* is somewhat intermediate, the approximation being less marked. Then the species of the genus are not all of them furnished with distant setæ; in a good many of the South-American species the setæ are strictly paired; this difference is itself of greater importance, I think; and the close pairing of the ventral setæ in the neighbourhood of the male pores is an intermediate condition between the paired setæ and the distant setæ. If it is thought necessary to divide what I here call *Microscolex* into two genera, a more suitable line of division, as it appears to me, would be to separate off those species in which the testes and sperm-duct funnels are only one pair; this division would include all the new species described in the present paper with the addition of *Microscolex spatulifer*, and would include all the South-American forms, excepting only *M. dubius* and *M. modestus*. I do not, however, propose even this division of the genus.

Most of the new species differ from *Microscolex modestus* and *M. dubius*, the types of the genus, in having a prostomium which entirely divides the buccal segment, and in that the setæ are strictly paired. As, however, these two characters are not always correlated, I do not think it possible to create any new genera. Another interesting feature about some of the new species of *Microscolex* is that, like *M. spatulifer* and many of the *Acanthodrilus*, they are very brightly coloured.

The internal structure does not present much of great interest. Indeed, the uniformity of the Cryptodrilidæ as a whole is in striking contrast to the greatly varied structure of the Eudrilidæ, with which I do not think that anybody now would venture to associate them.

(1) **Microscolex griseus**, n. sp.

This species, like *Microscolex spatulifer*, is one to which the generic name *Microscolex* is etymologically inapplicable. It is a large species, nearly if not quite as large as *Microscolex spatulifer*.

A considerable number of specimens were collected in a garden in Valparaiso. They vary greatly in size, some being mature and others not so.

The biggest specimen is 84 mm. in length by 5 mm. in diameter. The number of segments of this individual was 117.

The colour of the living worm is described by Michaelsen in the following terms: "schmutzig grau; vorne schmutzig fleischfarbe; Gürtel weiss bis bräunlich." The preserved worms are of much the same colour.

During life the worm was remarkable as "lebhaft schlängelnd bei Berührung."

The setæ are strictly paired. Dorsal pores are present.

The clitellum occupies segments xiii.–xvii. There is a median genital papilla upon segment xvi.; the male pores are on xvii.

The prostomium, as in so many species of the genus, is completely carried over the buccal segment by grooves. The first setigerous segment has in most specimens a furrow on the dorsal surface which extends right across that surface, but is not visible ventrally. This gives a little the impression that the prostomium is an incomplete one.

The gizzard is large; it lies in segment vi. It is immediately followed by a thin and delicate septum, behind which are five septa, moderately thick. The last heart is in the twelfth segment.

The sperm-sacs are in the ixth and xith segments; those of the latter segment are so coarsely racemose that they appear to be formed of a number of small separate sperm-sacs; this does not apply to the anterior pair.

The spermiducal glands are different from those of any other *Microscolex* which I examined in their regular tubular form and in the complex coiling; they look much more like the corresponding glands of certain Acanthodrilidæ. Moreover, the duct of the gland is unusually conspicuous; it is also long and is not more than one-third of the diameter of the gland. It has a distinctly nacreous glitter. In common with the spermiducal glands opens on each side of the body a sac of penial setæ; there are two of these on each side. They are very yellow in colour and have a bent bow-like form. The extremity is only moderately pointed and a little flattened and expanded. Fine spinelets ornament the extremity.

The spermathecæ in segment ix. are particularly large. The racemose diverticulum is borne at the end of a long muscular stalk.

Hab. St. 12, Valparaiso, in garden; St. 6, Quilipue; St. 22, Coronil; and St. 25, Valdivia, San José.[1]

(2) **Microscolex longiseta**, n. sp.

This is a small, rather transparent species, with little or no trace of integumental pigment.

[1] From each of the last two stations a single individual *probably* of this species.

The length of a specimen selected for measurement was 40 mm. by 3 mm. in diameter.

Number of segments 95.

The prostomium is complete. Dorsal pores are visible.

The clitellum occupies segments xiii.–xvii., and is not developed all round the body.

There are no papillæ of any kind that I could discover.

The gizzard is in segment vi. The last heart is in xii. The sperm-sacs in xi.

The sacs of penial setæ are, as in *Microscolex papillosus*, of enormous length. They measure 6 mm. and extend through fourteen segments. The spermiducal glands, on the other hand, only extend through six segments. The penial setæ have the same form as in *Microscolex papillosus*.

The spermathecæ are also exactly as in that species.

Hab. St. 193, Tierra del Fuego, Puerto Pantalon; St. 187, Tierra del Fuego; St. 140, Uschuia; St. 178, Navarin, Porto Toro.

(3) **Microscolex papillosus**, n. sp.

Of this rather remarkable new form three individuals were taken in forest at Uschuia.

The largest specimen measures 87 mm.; its diameter is only 3 mm.; the number of segments 95. The worm is thus a slender species.

Like so many of the American species of *Microscolex*, it is pigmented; but the pigmentation is not very great, the anterior end of the worm dorsally being alone much coloured. The colour is purplish. In one individual there was no pigment.

The setæ are quite strictly paired. The prostomium is not continued by furrows over the entire buccal segment; it extends over about half of it. The clitellum occupies segments xiii.–xvi.; it is complete. On the sixteenth segment in the middle line is a deep hole, looking as if caused by the contraction of the stout muscles connected with it and passing to the dorsal parietes.

This is very characteristic of the species, and was not confined to the largest individual which was selected for dissection. It lies in the clitellar region, but is lined by a strong tall epithelium, which is not glandular like that of the clitellum.

There seem to be no dorsal pores.

The genital papillæ are very numerous, an unusual state of affairs in this genus. There are at least six of them round somewhat translucent areas, possibly rather sense-organs than glandular papillæ, upon the middle of segments xii.–xii.; I am inclined to think that others were to be distinguished upon the clitellum. But I did not, with a view of preserving the specimen intact, submit this part of the body to a microscopical examination. In another specimen there was an additional papilla upon xiii., a smaller median papilla upon xv., and a pair upon xvi., one on either side of the median depression.

The male pores upon segment xvii. are very prominent; each is

situated on a conspicuous papilla; the end of the spermiducal gland appeared to be protruded, thus forming a second "papilla" of smaller size upon the first.

The two orifices are near together.

The internal characters of this *Microscolex* serve in great part to differentiate it from its allies, among which *Microscolex longiseta* is the nearest. The first septum divides segments iv.–v.; septa ix.–xii. are thickened. There is a moderately sized gizzard in segment v. The intestine seems to begin in xvii., but in longitudinal sections I cannot draw a line between it and the œsophagus. The latter is straight until the end of xi.; afterwards it is constricted by the septa. The sperm-sacs are in segment xi., as is so generally the case with the worms of this genus. The testes and funnels are in x. There is also a pair of sperm-sacs in ix., attached to the posterior wall of that segment and racemose, though containing little or no sperm.

The single pair of spermathecæ are in segment ix. Each is an oval pouch with a diverticulum as long as itself; the diverticulum is coiled in a spiral and ends in a swollen extremity. This is lined with a much-folded epithelium, so that the lumen appears to be divided by numerous radiating partitions.

The most remarkable feature in the internal organization of the worm concerns the spermiducal glands. These are very long and of the usual tubular form. The entire efferent apparatus extends back to the xxviith segment, thus occupying ten segments. It measured 8 mm. in length. The spermiducal gland, however, did not reach so far back; but the muscular sac containing the penial setæ passed beyond the end of the spermiducal gland. The latter is coiled slightly upon itself once or twice; it opens on to the exterior by a moderately short and narrow muscular duct. The sac containing the penial setæ contained two of them, which were of such different lengths that one might speak of a dimorphism in the setæ. One measured the full 8 mm., the other was not half its length. They were alike, however, in their form being without ornamentation at the free end. The sac contained an immature seta of a pale colour contrasting with the bright yellow of the mature seta, which was much longer than the smaller of the mature setæ. The base of implantation of these penial setæ was supplied with abundant blood-capillaries. The penial setæ, the single sperm-duct, and the spermiducal gland open separately on to the exterior, though near together.

(4) **Microscolex michaelseni**, n. sp.

This is one of the most abundant species of Earthworms among the worms collected by Dr. Michaelsen. I have great pleasure in associating it with his name as a mark of my respect for the valuable work which he has done in this department of natural history.

The present species is a very well-marked form, and it is a matter of surprise to me that it has never yet been described from

this part of the world. It appears to be a very southern Patagonian form. It occurs in fresh water as well as upon dry land, as is also the case with *Acanthodrilus pictus* and a few other worms.

The species is long and slender, and is quite bleached by the alcohol.

A typically sized specimen selected for measurement was 85 mm. long by 3 mm. broad, and consisted of 92 segments.

The prostomium is continued for some way over the buccal segment by grooves, but these do not reach the end of that segment.

The setæ are more paired ventrally than laterally, the distance between any two lateral setæ being about twice that between the ventral setæ. The clitellum occupies segments xiii.–xvi. and is quite complete.

The nephridiopores open in front of seta 3.

The oviducal pores lie exactly in line with seta 1.

The most characteristic external feature in the organization of this worm is afforded by the male pores. These pores in the present genus are, as a rule, very conspicuous, but are more or less rounded orifices confined to the xviith segment. In *Microscolex michaelseni* the male apertures are represented by crescentic slits, which commence upon about the middle of the xviith segment and extend back to at least the posterior extremity of that segment, and sometimes even encroach upon the xviiith segment. This groove is wider in front than behind. An investigation of it by means of transverse sections showed that the spermiducal glands and the penial setæ opened in common at the anterior end of the groove where it is widest. The sperm-ducts open at the posterior end. In this wide separation between the external apertures of the sperm-ducts and the spermiducal glands, the present species resembles *Microscolex* (*Rhododrilus*) *minutus*. It will be observed also that the present species is almost an Acanthodrilid in the relations between these organs. The only actual difference between the Acanthodrilidæ and the Cryptodrilidæ which is invariable, is that in the one (Acanthodrilidæ) the sperm-ducts open a segment behind or in front of the spermiducal glands; in the Cryptodrilidæ, on the other hand, if the two apertures are separated, they are upon the same segment. In *Microscolex michaelseni*, however, in some specimens at any rate, the apertures must be at least only just not upon consecutive segments, and in other specimens the groove extended well into segment xviii. On segments xvii., xviii. are a pair of rounded papillæ which lie just behind the furrows, separating these segments from the one in front. Sometimes the anterior pair are closer together than the posterior.

The alimentary canal is not provided with a well-developed gizzard; there is a rudimentary one only in segments vi., vii. The œsophagus gradually passes into the intestine, which acquires its full calibre in the xvith. The last pair of hearts are, as is usual

with the genus, in the xiith segment. The testes are large and bushy; there are only a single pair of them lying in segment x. Opposite the testes are the conspicuous funnels of the sperm-ducts. I could find neither testes nor funnels in segment xi., where, however, are a pair of large and racemose sperm-sacs.

The spermiducal glands are plainly separable into a glandular and a non-glandular portion. The latter is rather less than one-half of the length of the former and very much more slender. The entire gland is straight and occupies about four segments. It opens in common with an opaque thick-walled sac containing penial setæ. This sac is not so long as, but much stouter than, the muscular end of the spermiducal gland. The sac contained, in a specimen dissected by me, 8 penial setæ on one side of the body. Only two of these, however, appeared to be fully mature. These were to be distinguished from the rest by the fact that the implanted end was curved. In the others this end was broadened out. In the former setæ the free end of the seta tapering gradually to the end was unornamented; in another specimen, however, these setæ were faintly ornamented. I am therefore disposed to think that the ornamentation upon the immature setæ is a mark of their immaturity, the spines being as a rule worn off in the setæ which happen to be in use. A curious difference in the constitution of the two kinds of setæ was shown by treating them with a strong solution of potash: when this reagent was applied, the presumably immature setæ became almost invisible, while the others did not exhibit any changes.

There is nothing worthy of comment concerning the ovaries and their ducts. The spermathecæ are a single pair lying in segment viii. They are oval pouches, each with two symmetrically arranged diverticula, in which alone there appeared to be sperm. The spermathecæ are precisely like those of *Acanthodrilus bovei*.

In the gatherings from Punta Arenas and Uschuia, I found specimens coexisting with the normal form which were shorter (50 mm., 95 segments), and had a single median papilla upon segment xvii. instead of a pair. One specimen, however, had the two pairs of papillæ characteristic of the typical variety; hence I do not separate them as species.

Hab. St. 75, Magellan Straits, Punta Arenas. St. 140, Uschuia, forest. St. 65, Magellan Straits, fresh water. St. 179, Navarin Isl., Porto Toro. St. 165, Puerto bridges.

The resemblance between this species and *Acanthodrilus bovei*, coupled with their occurrence in the same locality, is interesting. This resemblance extends to internal characters. The spermathecæ are similar in both, and in both the intestine begins unusually early, the xviith being the more usual segment. I call attention in the course of this paper to the likeness, more or less pronounced, between other species of *Microscolex* and other species of *Acanthodrilus*.

Apart from these particular likenesses, it is a curious and not wholly intelligible fact that the bulk of the South-American

species of *Microscolex* and *Acanthodrilus* agree in that the sperm-sacs are in xi. or in ix. and xi.; this is not a usual position. With this may be compared the fact that the Australian Cryptodrilids frequently agree with the Australian Perichætas in that the sperm-sacs are in segments ix., xii., also not a usual position.

(5) **Microscolex gracilis**, n. sp.

This species might easily be confounded with *Microscolex diversicolor*, at least with the less strikingly-coloured examples of that species. It has precisely the same dark purple colour dorsally, the implantation of the setæ being yellowish white; the end of the body, too, has the quadrangular aspect of the corresponding part of the body in *Microscolex diversicolor*. It is, however, in spite of this superficial likeness, quite a different species.

There were three examples, of which the largest measured 72 mm.; the diameter was 2 mm., except at the clitellum, where it was 3 mm. This individual consisted of 88 segments. It is therefore a long and slender worm; the clitellum is very prominent.

It may be at once differentiated from *Microscolex diversicolor* by the fact that the prostomium is not continued by furrows over the whole of the buccal segment.

The setæ are more or less distant, being divided by equal distances at the posterior end of the body, where the middle line of the segments is ridged. The setæ are here particularly large.

The clitellum occupies segments xiii.–xvi. and is complete.

I could not see any dorsal pores.

The male pores are separated by moderately wide intervals from each other; the orifice is wide and surrounded by a crenate margin.

The first septum separates segments iv./v. Septa ix./xii. are thickened.

The gizzard is well developed; it lies in segment viii.

The nephridia begin in segment ii.; they end in a muscular sac.

The sperm-sacs are in xi., xii. In a specimen investigated by longitudinal sections they occupied segment xi. only. The testes and sperm-duct funnels lie in x.

The spermiducal glands are stout and massive; they have a slightly sinuous course and occupy three segments. The penial setæ are also stout and not particularly long. They are bent like a bow, slightly expanded at the free end, but not ornamented.

The muscular duct, when traced back into the glandular part of the spermiducal gland, is seen to stop abruptly; its lining epithelium suddenly ending and being replaced by the indistinct lining epithelium of the glandular part of the organ. Followed in the other direction, the duct winds about and receives the sperm-duct a considerable distance in front of its external orifice; the latter opens at the end of a papilla, which projects into the interior of the gland-duct, which is at this point widened: it is suggestive of the penis of the Tubificidæ, &c. Further down the duct receives the

sac of penial setæ. At the external orifice it widens out into a sac of which the epithelium is more glandular on the ventral surface, being here composed of tall non-staining cells; from this sac a tube lined with a precisely similar epithelium leads to the exterior.

Hab. St. 140, Uschuia, forest.

The most singular feature in the internal organization of this worm is the ovaries: these are positively of enormous size. They are quite as large as the sperm-sacs of the same worm, and occupy a considerable amount of the cœlomic cavity of their segment (the xiiith). Not only are the ovaries themselves thus unusually large—the ova share in the increased size, but although they are very much larger than the ova of the common Earthworms of this country, they do not approach in any way the ova of the aquatic Oligochæta: that is to say, they have not got a great amount of yolk deposited within them—no more, in fact, is present than in other Earthworms. So large are the ova that they are not merely visible to the unarmed eye—this is possible even in the common *Allolobophora*—but they suggest parasitic Gregarines, with which I was disposed to identify the ova until they were submitted to microscopic examination.

The spermathecæ are in the ixth segment, as is almost invariably the case with this genus. A stalked diverticulum opens in common with an oval pouch; the diverticulum has a mulberry-shaped outline, and appears, as in other worms, to be the only receptacle of the sperm.

The minute structure of this diverticulum is also different from that of the pouch: when sections are taken through the periphery it presents the appearance of a compound tubular gland, the tubes being separated from each other by interstitial tissue. The whole diverticulum in fact consists of a much-folded epithelium.

(6) **Microscolex corralensis**, n. sp.

Of this apparently new form I only found a single species in a copious gathering from Corral, Valdivia.

Its length is 40 mm., the diameter 4 mm.; the number of segments a little over 70. In the preserved state this worm is a pale greyish brown, the clitellum being pinky brown.

The prostomium is continued by furrows over the entire buccal segment: these furrows converge posteriorly but do not meet.

The clitellum occupies segments xiii.–xvii., the posterior part of xiii. and the anterior part of xvii. not being invaded by glandular substance. On xii. and xiv. alone the clitellum is complete; on the remaining segments it only reaches the ventral pair of setæ.

The setæ are strictly paired from end to end of the body. On the segments immediately in front of and behind the xviith (which bears the male pores) the ventral pairs diverge from each owing to the tension caused by the rather lateral position of the male pores.

There are dorsal pores, but I am unable to fix the exact segment in which they commence.

Some of the segments in the neighbourhood of the spermathecæ

and of the male pores bear genital papillæ. There are a pair on each of segments x., xv., xviii., xix. behind the ventral pairs of setæ, a single median papilla on x., and one transversely elongate papilla on xx., xxi.

The male pores are very protuberant, and, as already mentioned, are rather lateral in position. They are of course upon xvii.

With regard to internal structures, I have had to be careful so as not to unduly injure the single specimen at my disposal. The gizzard is large and conspicuous, and appears to lie in segments vi. and vii. Behind this are seven septa, which are strengthened and lie within each other like a series of cups. The last heart is in segment xii.

The racemose sperm-sacs are in segment xi. I believe that there are only a single pair of testes and sperm-duct funnels in segment x., but am not quite sure.

The ovary (in xiii.) is remarkable for being a very perfectly flat plate ending in a free tip as in *Lumbricus*, which projects beyond any of the ripe ova.

The spermiducal glands are massive and somewhat coiled; they end in a very short and narrow duct. There are penial setæ of considerable length (2·5 mm.), two in number in each bundle. These end in a flattened expansion which has a membranous appearance; for some distance in front of this the seta is so regularly marked and with such deep transverse striæ, that it presents quite the appearance of the flagellum of the antenna of a lobster. It is simply an exaggeration of the striæ generally to be found upon the extremity of penial setæ.

The spermathecæ are in ix. Each is a good-sized pouch terminating in a duct, from which arises a single diverticulum of much the same form as the pouch but smaller.

Hab. St. 47, Corral.

(7) **Microscolex robustus**, n. sp.

This new species of *Microscolex* is represented by a single specimen from Teja Isl., and three from Valdivia, Putabla. This specimen was unfortunately not fully mature, though the immaturity seemed to concern the clitellum only.

It is a moderately large species, less than *M. griseus* or *M. spatulifer* and about the size of *M. dubius*. The coloration is on the same plan as that of *M. diversicolor*; it is not, however, so brilliant as in that species. The area upon which the lateral setæ are implanted is, as in the last-mentioned species, white, while the dorsal surface of the worm is purplish. The length of this individual is 57 mm., the diameter 6 mm.; number of segments 95.

The prostomium is continued over the buccal segment by grooves.

The setæ are paired anteriorly but not strictly; the ventral setæ on segment xiii. are a little closer together than on the preceding segments, this convergence continues until the xvith segment; they begin to diverge on the xviith segment, and by the

xxth, which marks the limit of divergence, have got to be wider apart than they are on the anterior segments of the body. They continue to the end of the body without any further change.

I could see no dorsal pores.

The clitellum, as has been already mentioned, was not developed in the type. In an example from Putabla it occupies segments xiv.–xvii.

The gizzard lies in segment vii.

The specially thickened septa are few in number. As a general rule in this and, indeed, in other genera, the thick septa begin with the second septum; in the present species this is not the case; the thickened septa are only two, those separating segments x./xii. The capacity of the xth segment is very limited. The septum which divides it from the segment lying in front is closely applied to septa x./xi. In the narrow room thus formed lie the testes and the funnels of the sperm-ducts.

The racemose sperm-sacs lie in segment xi.

The single pair of spermathecæ are small, perhaps on account of the immaturity of the worm. The form is not particularly remarkable; the sac has a diverticulum not quite so long as itself but narrower.

The spermiducal glands are not particularly large. They are confined to their segment. In the single bundle of penial setæ which I examined, I found three penial setæ of about the same length and general appearance except as regards colour; one of the three setæ was a very pale colour, while the other two were bright yellow. I presume that the first-mentioned seta was immature. All of them end in a bluntish point and are quite unornamented.

Hab. Teja Isl., Valdivia (St. 39). St. 30, Valdivia, Putabla.

From Estancilla (St. 41) was collected a larger individual, which seems to be, though it is difficult to be quite certain, a sexually mature specimen of the same species. This worm is 72 mm. long by 7 mm. in diameter, and consists of 82 segments. The clitellum occupies segments xiv.–xvii. There are a number of genital papillæ; a pair on each of segments ix., xv., xvi., and an asymmetrical one on xiv.; on each of segments xvii. and xviii. there are three papillæ. The spermiducal glands of the mature worm have a warty appearance; the penial setæ are very faintly ornamented with transverse ridges.

(8) **Microscolex diversicolor**, n. sp.

A good many examples of this species were collected in Valdivia, in Chile. It is a worm which has an exceedingly marked coloration, and is therefore always conspicuous in any collection. The colour of the dorsal surface is a bright purplish red, extending on to the sides of the body beyond setæ. The dorsal setæ are implanted in areas which are equally conspicuous on account of the fact that they have no pigment and appear white. In some

individuals the colour was much more sombre and there was hardly any indication of the white seta areas.

The largest individual which was measured had a length of 52 mm., a diameter of 3·5 mm., number of segments 60. This was one of the more darkly coloured individuals, which might perhaps be regarded on account of this slight difference as a variety. A more typical specimen (as regards colour) was 32 mm. by 3 mm., with 56 segments. But there is a considerable range in size.

The prostomium completely divides the buccal segment.

The setæ are not strictly paired, but the setæ of the lateral couples are farther away from each other than are those of the ventral. The latter hardly come nearer to each other on the segments in the neighbourhood of the xviith ; the approximation is not marked, as in some species.

The clitellum occupies segments xiii.–xvi., half only of the first and last.

The dorsal pores are present and appear to begin on the clitellum.

The gizzard is large compared to the size of the worm ; in the smaller of the two individuals whose measurements are given above it was in segments vi., vii. In a specimen sectioned longitudinally the greater part of the gizzard was seen to lie in vi. The intestine begins in xvii. Behind the gizzard are a number of septa which, though not greatly thickened, are stouter than those which follow them. The last of these bounds segment xiv. anteriorly.

The last heart is, as usual, in segment xii. The nephridia commence in segment v.

There is only a single pair of testes and funnels in segment x. The sperm-sacs are large and racemose and lie in segment xi. There is also a pair in ix. which are a good deal less obvious.

The spermiducal glands are stout and of the tubular character invariably found in this genus. The muscular duct leading to the exterior is moderately long. The penial setæ (two in a sac) are longish (2·5 mm.) and quite unornamented. The free extremity gradually tapers to a point. The sac of setæ opens in common with the spermiducal gland. The sperm-duct opens just separately on to exterior.

The spermathecæ are in ix. The diverticulum is nearly as long as the pouch, but has a mulberry-like appearance. In sections the diverticulum shows much the same structure that I have described above in *M. gracilis*.

The same locality also produced three specimens of a small *Microscolex* which I was at first inclined to regard as a distinct species. I consider, however, that it is merely a small variety of *Microscolex diversicolor*. The total length of the largest individual is 30 mm., the diameter 2 mm., number of segments 100. It is evidently therefore a more slender worm than the type. The setæ appear to be a little more paired than in the type.

Hab. St. 41, Valdivia, Estancilla. St. 48, Corral. St. 38, Valdivia. St. 36, Valdivia. St. 46, Corral.